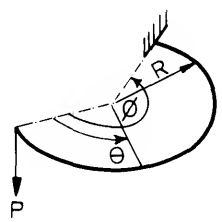
Table 30.2 Design Equations for Traversely Loaded Arched Cantilevers

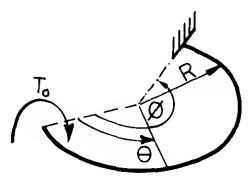
Concentrated End Load

$$Y = \frac{PR^3}{EI}(B_1 + \lambda B_2)$$
$$\psi = \frac{PR^2}{EI}(\lambda B_3 + B_4)$$
$$\eta = \frac{PR^2}{EI}(\lambda B_5 - B_1)$$
$$M = -PR \sin\theta$$
$$T = PR\,(1 - \cos\theta)$$



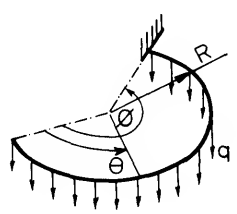
End Twisting Moment

$$Y = \frac{T_o R^2}{EI}(\lambda B_5 - B_1)$$
$$\psi = \frac{T_o R}{EI}(\lambda - 1)\,B_4$$
$$\eta = \frac{T_o R}{EI}(\lambda B_6 + B_1)$$
$$M = T_o \sin\theta$$
$$T = T_o \cos\theta$$



Uniform Loading

$$Y = \frac{qR^4}{EI}(\lambda B_7 - B_3)$$
$$\psi = \frac{qR^3}{EI}(\lambda B_8 + B_5)$$
$$\eta = \frac{qR^3}{EI}(\lambda B_9 + B_3)$$
$$M = -qR^2\,(1 - \cos\theta)$$
$$T = qR^2\,(\theta - \sin\theta)$$



$B_1 = (2\phi - \sin 2\phi)/4$
$B_2 = (6\phi + \sin 2\phi - 8\sin\phi)/4$
$B_3 = (4\cos\phi - \cos 2\phi - 3)/4$
$B_4 = (\cos 2\phi - 1)/4$
$B_5 = (4\sin\phi - \sin 2\phi - 2\phi)/4$
$B_6 = (2\phi + \sin 2\phi)/4$
$B_7 = (2\phi^2 - \cos 2\phi - 4\phi\sin\phi + 1)/4$
$B_8 = (4\sin\phi + \sin 2\phi - 4\phi\cos\phi - 2\phi)\ 4$
$B_9 = (4\cos\phi + \cos 2\phi + 4\phi\sin\phi - 5)\ 4$